CLAIMS

1. Process for decorating the cylindrical wall of containers characterized in that it comprises at least the following steps:

a) moving mandrels (12, 13) are used mounted on a loop circuit, each mandrel having a diameter slightly less than the diameter of the cylindrical wall of the container and being mounted on a support capable of moving such that the axis of the mandrel remains parallel to a given direction D, the mandrel being mounted onto its support in such a way that it is able to rotate around its axis while resisting a force exerted perpendicular to the axis;

b) each container is successively brought flush with a mandrel then fitted onto the mandrel;

c) the mandrel thus covered with the container is brought into the vicinity of an impression roll (11) able to rotate around an axis parallel to the direction D;

d) while it is being moved towards the impression roll, the mandrel is made to rotate around its axis;

e) a transfer film bearing strip (14) is run into the gap between the impression roll (11) and the mandrel (13) covered with the container;

f) the mandrel (13) and the impression roll (11) are brought into contact with each other, the cylindrical wall of the container and the surface of the impression roll being driven at a substantially equal tangential velocity, the contact translating into a force exerted by the impression roll on the mandrel through the transferable film bearing strip and the wall of the container;

g) the bearing strip is then moved away from the surface of the container, with the result that the part of the transfer film remaining bonded to the container wall is detached from the bearing strip, thus bringing about the decoration;

h) the mandrel and container unit is then moved away from the impression roll in order to leave room for the next mandrel;

the process being characterized in that:

A) the impression roll is driven, for example using a motor, typically an electric motor, in a continuous rotary motion around the axis, the axis being fixed;

B) the mandrel is made to rotate at a speed correlated with that of the impression roll

such that when the mandrel comes to be flush with the impression roll, the tangential velocity of the cylindrical wall of the container in rotation is substantially equal to the tangential velocity of the surface of the impression roll;

C) the transfer film bearing strip is run into the gap between the impression roll and the mandrel covered with the container such that it moves at a linear velocity substantially equal to the their own tangential velocities.

2. Process according to claim 1 wherein the impression roll is a marking roll (11) provided with an etched surface.

3. Process according to claim 2 wherein the force applied by the raised parts of the etched surface causes the compression of a part of the transfer film which thins out and adheres to the wall of the cylindrical container and wherein, when the bearing strip is moved away from the surface of the container, the marked part of the transfer film which remains bonded to the container wall is detached from the bearing strip, thereby bringing about the decoration being implemented.

4. Process according to claim 2 or 3 wherein the marking roll is hot and the transfer film is a thermal transfer film.

5. Process according to claim 4 wherein, when the bearing strip (12) has left the marking area because of the rotation of the mandrel (13), the bearing strip (12) is held against the cylindrical wall of the container long enough to allow the bearing strip and the marked transfer film to cool down to a temperature that makes the film easier to detach by cutting along the boundary between the marked area and the unmarked area.

6. Process according to any one of claims 1 to 5 wherein the mandrels are mounted on a turntable the axis of rotation of which is parallel to the axes of the mandrels.

7. Process according to claim 6 wherein the turntable operates stepwise, the mandrel finding itself at each stop flush with an area for handling or treating the container.

8. Process according to any one of claims 1 to 7 wherein the mandrel is made to rotate by acting such that it is able to reach the appropriate velocity before it reaches the marking area.

9. Process according to claim 8 wherein the impression roll (11) rotates at a constant speed of rotation.

10. Process according to any one of claims 2 to 9 wherein the position of the axis of the marking roll (11) is defined relative to the trajectory (20) of the mandrels such that when they come into contact with each other, a force is applied to the contact generatrix line that is weak enough for the mandrel to be able to resist mechanically and strong enough for the transfer film to be marked by the raised parts of the etched surface of the roll.

11. Process according to any one of claims 4 to 10 wherein the cylindrical body is a flexible tube, the cylindrical skirt of which has a thickness of between 250 and 600 microns, the marking temperature required by the hot stamping roll is between 80 and 250°C and the support force of the roll on the mandrel is between 2 N/mm and 40 N/mm.

12. Process according to any one of claims 4 to 11 wherein the bearing strip is held, after marking, against the cylindrical wall of the container over an aperture angle α over 20°, preferably over 30°.

13. Process according to any one of claims 4 to 12 wherein the bearing strip is held, after marking, against the cylindrical wall of the container, until the surface of the container reaches an average temperature below 80°C, preferably below 60°C.

14. Process according to any one of claims 4 to 13 wherein a drive device (31) of the bearing strip (14) is mounted downstream from the marking area such that the tension of the bearing strip is as low as possible as it leaves the marking area.

15. Process according to any one of claims 4 to 13 wherein, during marking, a device driving the bearing strip (14) is moved so that it enters the trajectory (20) of the mandrels allowing the bearing strip to be applied against the container wall, the contact being maintained over an angular aperture over 30°.

16. Process according to any one of claims 4 to 15 wherein a cold air flow is circulated over the bearing strip as it leaves the marking area.

17. Process according to any one of claims 2 to 16 wherein, after fitting the container onto the mandrel (12), the mandrel is rotated, an optical determination (40) is made of a pre-marked index on the container and the rotation of the mandrel is calculated such that the cylindrical wall of the container comes into contact with the marking roll surface by presenting itself according to a preset angular position, with a tangential velocity substantially equal to the tangential velocity of the etched surface of the marking roll.

18. Process according to claim 17, wherein the device (40) allowing the optical determination of a pre-marked index of the decoration is complemented by a second optical device, typically a video camera, connected to a corrective information system, which through the use of image analysis software, allows the angular and axial position of the mandrel to be corrected.

19. Process allowing the formation of a raised decoration on the cylindrical walls of containers characterized in that it comprises at least the following steps:

a) moving mandrels (12, 13) are used mounted on a loop circuit, each mandrel having a diameter slightly less than the diameter of the cylindrical wall of the container and being mounted on a support capable of moving such that the axis of the mandrel remains parallel to a given direction, the mandrel being mounted onto its support in such a way that it is able to rotate around its axis while resisting a force exerted perpendicular to the axis;

b) each container is successively brought flush with a mandrel then fitted onto the

mandrel;

c) the mandrel thus covered with the container is brought into the vicinity of a marking roll (11), the marking roll having an etched surface according to the decoration required, the etched surface being driven in a continuous rotary motion around the fixed axis of the marking roll;

d) while it is being moved towards the marking roll, the mandrel is made to rotate at a speed correlated with that of the marking roll such that when the mandrel comes to be flush with the marking roll, the tangential velocity of the cylindrical wall of the container in rotation is substantially equal to the tangential velocity of the etched surface of the marking roll;

e) the mandrel (13) and the marking roll (11) are brought into contact with each other, the contact translating into a force exerted by the marking roll on the mandrel through the wall of the container, the force being applied by the raised parts of the etched surface, bringing about the marking of the wall of the cylindrical container;

f) when the entire decoration is marked, the mandrel and container unit is moved away from the marking roll to leave room for the next mandrel (12).

20. Device allowing the process to be implemented according to any one of claims 1 to 19 characterized in that it involves a machine that includes a fixed plate placed opposite a turntable operating stepwise, the turntable being equipped with mandrels (12, 13) able to rotate around their axis, the axis being parallel to the axis of rotation of the plate, the mandrels being brought in succession during the rotation of the plate into several work areas provided on the fixed plate, these work areas including at least:

a) a feed area where the cylindrical bodies are brought opposite a mandrel then fitted around the mandrel;

b) an area for depositing or marking a decoration on the cylindrical wall of the containers including at least one impression roll (11) in continuous rotation around a fixed axis parallel to the axis of the plate, preferably with a constant speed of rotation, placed at a spot such that when a mandrel (13) comes to be flush with

the roll, the latter comes into contact with the mandrel by exerting a support force distributed over a generatrix line, the mandrels being driven by rotation means, typically servomotors, making it possible to pass from zero tangential velocity to a tangential velocity equal to that of the impression roll after a length of time less than that corresponding to the movement of the container from one work area to the next;

c) an area for removing the containers.

21. Device according to claim 20 wherein the impression roll is a marking roll provided with an etched surface.

22. Device according to claim 20 or 21, also including a device (30) for running a transfer film bearing strip (14), running the strip in the marking area, the device being provided with systems (31) allowing the tension of the strip to be controlled, particularly as it leaves the marking area.

23. Device according to any one of claims 20 to 22 applied to the decoration of cylindrical skirts of flexible tubes characterized in that it involves a machine that includes a fixed plate placed opposite a turntable operating stepwise, the turntable being provided with mandrels (12, 13) having their axes parallel to the axis of rotation of the plate and able to rotate around their axes, the mandrels being brought in succession during the rotation (R) of the plate into a number of work areas provided on the fixed plate:

-the area for feeding flexible tubes and fitting the cylindrical skirts of the flexible tubes around the mandrel;

- an optional area for removing the sprue on the tube head;
- an optional area for putting a lid on the dispensing orifice;
- an optional area for capping;
- the marking area;
- an optional area for inspecting the decorations obtained;
- the area for removing the flexible tubes.

24. Device according to claim 23 wherein, directly upstream from the marking area, is provided an indexing area, where an optical tracking device (40) allows the angular position of a spot embodying a known particular point in the decoration to be detected and wherein the rotation of the mandrel (12) is actuated by a servomotor controlled using an algorithm which allows the necessary correction to bring the cylindrical body to the marking station at the right position and at the right speed of rotation to be calculated from data supplied by the optical tracking device (40).

25. Device according to claim 24 wherein the optical tracking device (40) is complemented by a second optical device, typically a video camera, connected to a corrective information system which, using image analysis software, allows the angular and axial position of the mandrel to be corrected.

26. Process for decorating the cylindrical walls of containers characterized in that it comprises at least the following steps:

a) moving mandrels (12, 13) are used mounted on a loop circuit, each mandrel having a diameter slightly less than the diameter of the cylindrical wall of the container and being mounted on a support capable of moving such that the axis of the mandrel remains parallel to a given direction D, the mandrel being mounted onto its support in such a way that it is able to rotate around its axis while resisting a force exerted perpendicular to the axis;

b) each container is successively brought flush with a mandrel then fitted onto the mandrel;

c) the cylindrical wall of each container is printed in accordance with the required decoration with an ink or varnish promoting the adhesion of a transfer film;

d) the mandrel thus covered with the container is brought into the vicinity of an impression roll, the roll being driven in a continuous rotary motion around a fixed axis parallel to the direction D;

e) while it is being moved towards the impression roll, the mandrel is made to rotate

at a speed correlated with that of the impression roll such that when the mandrel comes to be flush with the impression roll, the tangential velocity of the container wall in rotation is substantially equal to the tangential velocity of the surface of the impression roll;

f) a transfer film bearing strip is run into the gap between the impression roll and the mandrel, such that when it arrives in the gap, it is moving at a linear velocity substantially equal to their own circumferential velocities;

g) the mandrel and the impression roll are brought into contact with each other, the contact translating into a force exerted by the impression roll on the mandrel through the transfer film bearing strip and the cylindrical wall of the container, the force causing the compression of the transfer film, translating into an adhesion of a part of the transfer film to the printed part of the cylindrical container wall;

h) the bearing strip is then moved away from the surface of the container, with the result that the part of the transfer film remaining bonded to the container wall is detached from the bearing strip, thus bringing about the decoration;

i) the mandrel and container unit is then moved away from the roll in order to leave room for the next mandrel (12).

27. Process for decorating the cylindrical walls of containers according to claim 26 modified in that the cylindrical wall of each container is printed in accordance with the required decoration with an ink or varnish promoting the rejection of the transfer film and that the mandrel and the impression roll are brought into contact with each other, the contact translating into a force exerted by the impression roll on the mandrel through the transfer film bearing strip and the cylindrical wall of the container, the force causing the compression of the transfer film, translating into an adhesion of a part of the transfer film to the unprinted part of the cylindrical container wall.

28. Process according to claim 27 wherein the transfer film has adhesive properties.

29. Process according to claim 28 wherein the impression roll is hot with the result that when the impression roll leans against the sleeve through the transfer film, the latter acquires the adhesive properties.